Office of Government Commerce

Open Source Software Trials in Government
Final Report

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Executive summary

Introduction

In September 2003 the Office of Government Commerce (OGC) announced that they would be coordinating, with the support of the Office of the e-Envoy, "Proof of Concept" trials of Open Source Software (OSS) in a range of public bodies in conjunction with IBM. In December 2003 the OGC announced that the scope would be extended to include the involvement of Sun Microsystems in trials coordinated by OGC. This report by OGC summarises the key findings from those activities and, to supplement the reports from the trials, also takes into account information obtained from other public sector activity in OSS planning and deployment in the UK and elsewhere in Europe

Note: The Office of the e-Envoy (OeE) became the e-Government Unit (eGU) in April 2004.

Background

Open Source Software is increasingly cited as a viable alternative to commercial proprietary software, with potential significant value for money benefits for government. It is based on the principle of software products made available by the OSS developer community (which includes commercial companies, academics and others) licensed for use with or without a fee. OSS licences generally give the user the freedom to use, copy, distribute, examine, change and improve the software. The commercial models that underpin OSS distribution typically include support charges, but there can also be other costs and benefits perceived to be associated with OSS deployment. Costs may include staff training, migration of existing files and applications, and the effort required to integrate with other software. Apart from reductions in the cost of software licences, benefits of Open Source can include cost avoidance through reductions in replacement cycles of hardware, improved software reliability and security, software platform stability, the ability to tailor and modify the software, easier administration, and greater scalability of hardware platforms.

The increasing availability of Open Source software – for infrastructure support, on the desktop and for business applications – expands the choices available to public sector organisations and supports new cost-effective approaches to IT architecture, software acquisition and development, and IT lifecycle management.

"Proof of Concept" trials
The objective of the Proof of Concept trials was to obtain information from live customer "case study" situations on a number of key issues:

- The viability of OSS; is OSS a credible alternative to proprietary software?
- Obstacles to implementation of OSS; what factors may inhibit the adoption of OSS, and how can they be overcome?
- The costs and benefits of OSS; what evidence is there for the value for money derived from adoption of OSS?
- Lessons learned in planning, implementation and operation of OSS.

Key Conclusions
On the basis of the empirical evidence and experience reported from the trials sites and elsewhere, the current study has concluded that:

- *Viability of OSS:* Open Source software is a viable and credible alternative to proprietary software for infrastructure implementations, and for meeting the requirements of the majority of desktop users;
- *Obstacles to implementation:* The main obstacles to widespread implementation of Open Source software are: for desktop applications, the current lack of complex functionality which can affect ease of migration and interoperability for some organisations; and for business applications, the lack of Open Source products to compete with large-scale proprietary enterprise-level products; no significant obstacles were noted for the adoption of Open Source in infrastructure developments;
- *Costs and benefits:* Adoption of Open Source software can generate significant savings in hardware and software costs for infrastructure implementation, and reduce the licensing costs and hardware refresh requirements for desktop implementation;
- *Lessons learned:* Adoption of Open Source, particularly for the desktop, requires investment in planning, training of users, development of skills for implementation and support, and detailed consideration of migration and interoperability issues.

There are currently three main potential areas of implementation of OSS - on servers, the desktop and business applications, and these are currently at differing levels of maturity.

OSS Server and infrastructure products, generally based on Linux, are now perceived by the market as mature, gaining increasing acceptance, and delivering significant value for money opportunities.

OSS Desktop products (including desktop platforms such as Linux, and "office" personal productivity suites) are developing but there still has been little significant widespread implementation, though these are currently starting to be rolled out in public sector bodies in other European countries.

OSS Business Applications generally are still immature, and the scope of business applications available as Open Source software is limited. Those applications that do exist as Open Source are currently more appropriate for small or medium-sized businesses than for large public sector bodies, as they generally lack "industrial strength.

No two enterprise-level IT implementations in government are exactly the same, and consequently the factors to be considered in relation to adoption of OSS, and the balance of costs and benefits, will vary between organisations. The short timescales of the current exercise, and in some cases the desire of trials sites to maintain confidentiality of financial details, have prevented OGC from coming to any firm quantified conclusions regarding the comparative total lifecycle costs of ownership of OSS and proprietary software. In addition, it is always difficult to identify the benefits arising from migration to OSS in isolation from the impact of changes in other areas such as the system architecture and work practices. However, empirical evidence from user sites has shown how the adoption of Open Source software can reduce the costs of acquisition of both software and hardware. In considering the implications of migrating to OSS, organisations should undertake a comparison of costs and benefits, and take into account the full lifecycle costs of continuing to use, support and upgrade proprietary software.

The growth in the adoption of Open Source software raises implications for future Government policy which, if it is to encourage future developments and deliver alternatives, will necessitate a more joined up approach. OGC and the e-Government Unit (eGU) will continue to work closely on the implementation of the government's OSS Policy.

Recommendations

Public sector bodies should:

- examine carefully the technical and business case for implementation of Open Source software and the role which OSS could play in current and future projects, working with their outsourced IT providers where appropriate;
- review the potential for server consolidation, comparing the benefits of OSS with proprietary solutions;
- consider the potential costs and benefits of migration to an OSS desktop for transaction users, (potentially in conjunction with use of "thin client" architecture solutions);
- identify the role of open standards in future IS/IT strategy and policy, in conformance with the e-Government Interoperability Framework (eGIF);
- consider requirements for the development of skills in Open Source development, deployment and operation within the organisation, and review the availability of such skills in their outsourced IT service providers;
- review their current infrastructure and applications - in collaboration with their outsourced IT providers where relevant - well in advance of any planned procurement or renewal, and determine whether current technologies and IT policies inhibit future choice; and if so consider what steps may be necessary to prevent future "lock in";
- consider the benefits of incremental change by diversifying OSS use beyond the server platform to products like Email, LDAP, Web and internet Browser.

1   Introduction

1.1   The rise of Open Source software

The adoption of Open Source software has for some time been recognised by public and private sector organisations around the world as a viable alternative to proprietary software in an increasing number of areas of information systems implementation. It is also widely perceived that Open Source software has the potential to deliver better value for money over the lifetime of information systems.

In the UK, the Office of the e-Envoy published a report on "Analysis of the Impact of Open Source Software" in 2001 (Qinetiq, 2001); this concluded that "OSS is indeed the start of a fundamental change in the software infrastructure marketplace". The Office of the e-Envoy with OGC published version 1 of the government's policy on Open Source software ("Open Source Software – Use within UK Government") in July 2002; version 2 will be released later in 2004. OGC published "Open Source Software: Guidance on implementing UK government policy" in September 2002; version 2 is due to be released later in 2004.

Many overseas administrations have published studies on the role and benefits of Open Source software, and many overseas governments and local authorities have taken steps to reduce their dependence on proprietary software and move towards the adoption of Open Source.

In July 2002 the EU published a report "Free/Libre Open Source Software: Survey and Study" (the FLOSS report), and in 2003 it published "The IDA Open Source Migration Guidelines", which provide practical and detailed recommendations on how to migrate to OSS-based office applications.

1.2   "Proof of Concept" trials

In view of the increasing interest in Open Source in both the private and public sectors, OGC and the Office of the e-Envoy wished to assemble evidence on the use and benefits of Open Source from public sector organisations in the UK. In September 2003 OGC initiated a project, supported by the Office of the e-Envoy, to facilitate "Proof of Concept" trials of Open Source software in a range of public sector bodies in conjunction with IBM. In December 2003 this arrangement was extended by OGC to include the involvement of Sun Microsystems. Both suppliers offered to work with demonstration "case study" sites, and to provide facilities and resources to support planning and implementation activities in collaboration with each of the public sector bodies.

The objective of the trials was to obtain information from live customer situations on a number of key issues:
-        The viability of OSS; is OSS a credible alternative to proprietary software?
-        Obstacles to implementation of OSS; what factors may inhibit the adoption of OSS, and how can they be overcome?
-        The costs and benefits of OSS; what evidence is there for the value for money derived from adoption of OSS?
-        Lessons learned in planning, implementation and operation of OSS.

The Proof of Concept trials ran from end-2003 to mid-2004; the progress of the trials varied between customer sites, depending partly on the ability of the customer organisations to fit in the necessary work on top of day-to-day operating pressures. In order to extend the scope of the information gathering, OGC has included in this report information gathered from contacts with customer sites in the UK outside the designated trial sites, and information on OSS deployments in public sector administrations elsewhere in Europe, for which details are publicly available on the Internet.

1.3   Acknowledgements

OGC would like to acknowledge the support given by IBM and Sun, and the cooperation of the organisations which participated in the trials and information gathering.

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2   Open Source: Background

Note: Much of the material in this section is taken from the OGC publication "Open Source Software – Guidance on Implementing UK Government Policy" (see references).

2.1   What is Open Source?

Open Source Software (OSS) is:

"Software where the source code (the language in which the program is written) is freely distributed with the right to modify the code, and on the condition that redistribution is not restricted, and indeed is obtainable for no more than the reasonable cost of reproduction."

In contrast, vendors of closed, proprietary, software provide only executable binary code, and not the human readable source from which that code is derived. Proprietary software vendors usually also place very specific limits on redistribution of the software.

The full formal definition of OSS published by the Open Source Initiative is available at: http://www.opensource.org/docs/definition.html

2.2   Scope of OSS - spread of usage

OSS is not ubiquitous. Aside from its strong presence in developer tools such as compilers, interpreters and scripting languages, areas where it is particularly strong are currently mainly infrastructure related, i.e. operating systems, firewalls, application

level relays and proxy servers, web servers, file and print servers, domain name servers, mail transport servers and network news transports. For example, Linux has a very strong presence in the infrastructure market as a server platform, and the most widely used Web server in the world today is the Apache Open Source server. As yet, with the exception of some niche areas such as graphics manipulation, OSS is not strong in the application arena (such as Database Management Software, ERP or Financial Systems). We are seeing a strong trend towards suppliers of application software porting their applications to Open Source operating systems such as GNU/Linux. We are also beginning to see strong OSS alternatives to the dominant desktop and personal productivity software and we expect this trend to continue and, indeed, accelerate. For example, OpenOffice.org is the largest Open Source project in the world, and over 30 million downloads of the OpenOffice desktop software suite have been made from the OpenOffice.org web site.

2.3 Adoption of Open Source

Benefits

- It tends to have strong support for open standards for interoperability. This complements UK Government's insistence on interoperability standards through mandatory compliance with e-GIF.

- OSS is supplier independent. This is attractive in cases where Government would normally insist on a software escrow agreement. If OSS is used then the source code is already available to the purchaser (as well as the wider community) and Government could simply take that code to a new supplier should the original supplier disappear or withdraw support for whatever reason.

- OSS has lower licensing costs. Most OSS is distributed under one of a range of "Public Licences" which mandate that the code should be available to all for little more than the cost of distribution. However, purchasers should note that OSS is not synonymous with "free software". Some free software is actually distributed in binary (compiled) form in the same way as proprietary software. One of the main benefits in greater use of OSS may arise from the pressure that OSS's lower licensing costs puts on proprietary software licences.

- OSS tends to be portable to a wider range of platforms. Even where a particular platform is not currently supported, the open availability of the source code allows the community to port that software to a new platform relatively quickly. Platform independence gives the purchaser a wider choice of hardware in any procurement.

- Patches or updates to OSS following discovery of faults such as security vulnerabilities tend to be produced very rapidly, often within hours or days of announcement of the discovery of a problem. Users of closed source proprietary software are dependent upon the software vendor to release an upgraded binary version. This process can take considerably longer, leaving the user vulnerable to known threats.

- Avoidance of proprietary lock-in. OSS tends to be written to be independent of any other related product. Purchasers can often assume that one software product will work best with another from the same family produced by the same manufacturer. Use of OSS offers users greater freedom to purchase other products, thus reducing the tendency to lock-in.

<u>OSS: Perceived weaknesses or drawbacks</u>

- Uncertainty as to what exactly constitutes OSS and what its relative strengths and weaknesses are.

- Fear that support can be fragmented or difficult to obtain, particularly for niche products. That fear may now be misplaced. Public sector bodies should note in particular that many large suppliers such as IBM, Sun and HP are investing considerable effort and providing tier 1 support for the GNU/Linux operating system. Further, many proprietary software suppliers are porting their applications to run under GNU/Linux. Linux distributors have also extended their support life-cycles for their product sets. We expect this trend to continue and accelerate.

- Misunderstanding of the licensing and IPR implications of using or purchasing OSS.

- Difficulties in identifying appropriate OSS applications for particular business problems. Because OSS is not "advertised" in quite the same way as is proprietary software, public sector bodies may not be aware that a particular OSS product is available to meet their needs or that a product exists which could meet their needs after minor tailoring.

- Documentation can be idiosyncratic or sometimes non-existent. Many OSS developers are primarily motivated by exciting and/or innovative software development. They are less motivated to produce the sort of documentation that commercial buyers expect to see accompanying software. Where public sector bodies purchase systems which have a significant element of OSS embedded in them it is reasonable to request business-like documentation as part of the contract.

- Lack of real world experience and support for migration from closed proprietary software installations to OSS. Procurements are rarely made in "green-field" sites. Purchasers must be able to integrate OSS with their existing installed base and must understand how to migrate from a single supplier product set to a more diverse product set.

- OSS often lags behind proprietary software in support for new hardware. Largely this is the result of the hardware suppliers themselves not releasing new drivers to the OSS community on time. But, as with the issue of maintenance and support, that problem is diminishing as the hardware suppliers themselves begin to use and market OSS on their platforms.

2.4   OSS in the UK: OeE/OGC policy

The key decisions of the Office of the e-Envoy and OGC OSS Policy (published in July 2002) are:

- UK Government will consider OSS solutions alongside proprietary ones in IT procurements. Contracts will be awarded on a value for money basis.

- UK Government will only use products for interoperability that support open standards and specifications in all future IT developments.

- UK Government will seek to avoid lock-in to proprietary IT products and services.

- UK Government will consider obtaining full rights to bespoke software code or customisations of COTS (Commercial Off The Shelf) software it procures wherever this achieves best value for money.

- UK Government will explore further the possibilities of using OSS as the default exploitation route for Government funded R&D software.

The justification for adopting this policy is:

- There is a need to always procure a solution that gives value for money. This may be an OSS solution, or a proprietary one, or a mixture of both. Decisions should be made on a case by case basis.
- There is a need to ensure that interoperability of systems is provided and maintained. The e-GIF is mandated across the public sector and compliance with that is essential to the provision of e-services and joined-up Government.
- Every effort should be made to reduce the cost and risk to government systems. Adopting this policy helps achieve that by:
  - purchasing best value for money solutions
  - removing the reliance on individual IT suppliers
  - providing more flexibility in the development, enhancement and integration of systems
  - vesting the ownership of bespoke and tailored software code with Government.
- Security of government systems is vital. Properly configured OSS can be at least as secure as proprietary systems, and OSS is currently subject to fewer Internet attacks. A balance needs to be struck between the availability of security administration skills and the advantages of many diverse systems.

Version 2 of the OSS Policy is due to be published in 2004.

2.5 OSS in overseas administrations

Many overseas administrations and government-sponsored bodies have examined the role and benefits of OSS, and several have published their policies in relation to the adoption of Open Source software. A selection of the reports available in English on the Internet is listed in Annex A.

National and local governments which have moved to the adoption of Open Source software include:
- The city of Munich in Germany is migrating 14,000 desktops to a Linux platform, with OpenOffice as the office suite and Mozilla as the internet browser; the migration is expected to be complete by 2008/2009;
- The city of Bergen in Norway is migrating 20 database servers and 100 application servers to the Linux platform;
- The City Council of Barcelona in Spain has decided to migrate the city's IT systems and desktops to Open Source software;
- The region of Extremadura in SW Spain has been relying on Open Source software for several years; it has developed a network and services based on Open Source, used by schools and universities, local businesses, the general public and the regional and local administration; currently over 100,000 users are connected;
- The French Ministry of Equipment is replacing 1500 office and infrastructure servers with Linux servers;

- The Indian Department of Information Technology has developed a strategy to introduce Linux and open source software as de facto standards in academic institutions;
- The People's Republic of China plans to install at least 200 million copies of an Open Source-based desktop solution throughout the country, following an agreement between Sun Microsystems and the China Standard Software Co. Ltd.

3 Case Studies: Scope

3.1 Functional scope

In supporting the Proof of Concept trials of Open Source software, OGC aimed to gather information on the deployment of Open Source software in a number of distinct functional roles:

- Open Source infrastructure software: Migration to OSS as the platform for servers, together with OSS infrastructure software for server functions such as file and print servers, domain name servers, web servers and email servers;
- Open Source on the desktop:
  - Migration to OSS desktop office suite and personal productivity software only, on existing platform;
  - Migration to Open Source desktop platform together with OSS desktop office suite and personal productivity software;
- Open Source applications: Migration to OSS enterprise-level business applications to replace proprietary applications packages.

Most of these scenarios were represented in the Proof of Concept trials. There was experience reported of migrating servers and desktops to Open Source, but limited evidence of migrating or converting major applications to Open Source.

3.2 Evaluation

It was recognised that the organisations involved would generally not be able to continue to operate proprietary and OSS infrastructure software in parallel, so any evaluations within an organisation would have to be based on:

- "Before" (proprietary) and "After" (OSS) measurements - where these were available, given that various other parameters in the situation might also have changed; and/or
- Assessments and projections made as part of the planning for migration to OSS, for example in business cases or modelling exercises undertaken by the customer organisation.

The trial sites varied considerably in the extent to which they were able to measure comparative costs and benefits over the period of the trials.

3.3 Costs and benefits

It was intended to seek information where possible on cost/benefit comparisons between the proprietary and OSS approaches to implementation including:

- planning, acquisition, piloting and deployment of new software and any corresponding hardware, including any costs of migration and conversion of information assets, and any retraining of user and support staff;
- operation of the new software (proprietary or OSS), including "steady state" system management and administration, and user support;
- replacement and upgrade of the software, and any corresponding hardware upgrades.

The information which was sought from the customer sites was:
- assessments of financial costs and benefits arising from the deployment of OSS, compared with the actual or projected costs and benefits of proprietary software;
- assessments of the qualitative benefits derived from the deployment of OSS;
- lessons learned from the migration to OSS.

3.4 Sources of information
To supplement the information provided from the Proof of Concept trial sites, OGC also contacted other public sector sites in the UK with relevant experience, and gathered information available in the public domain on public sector sites overseas which have migrated to Open Source solutions or are planning such migrations. A list of all the sites referenced in the study, with background material for each site, is at Annex C.

4 Case Studies: Results

4.1 Open Source: Servers
The case study sites confirmed the widespread view that Open Source software is a viable platform for network server infrastructure. Organisations chose Linux as the platform for their server infrastructure on the basis of cost savings on software licences, improved security and better performance.

Many of the sites were using Linux-based servers, for a variety of purposes including web access, email support, file and print, and applications support. The MoD Defence Academy has based its complete Intranet and Internet configuration on Linux platforms, supporting Open Source applications such as Apache, Zope and Plone. The LinEx network in Extremadura is based entirely on Linux servers running Open Source server applications.

Several sites were able to accomplish significant savings by consolidating servers – Powys, for example, expect to reduce their 60 servers to fewer than 10.

There were no problems with system security reported by the case study sites. The view of the MoD Defence Academy is that a server infrastructure based on Open Source software is inherently more secure than one based on proprietary software.

A number of the case study sites were using Linux platforms to support server-based business applications, either purchased packages or developed locally. Central

Scotland Police, for example, are planning to develop an Electronic Document and Records Management System on their Linux servers.

The current exercise has shown the adoption of Linux to be relatively straightforward where (as in the West Sussex experience) there are existing Unix skills.

4.2   Open Source: Desktops
Several of the case study sites had migrated, or were in the course of migrating, their desktops to the StarOffice desktop personal productivity suite or, less commonly, the OpenOffice suite, based on either a Linux platform or the existing Windows platform. StarOffice is not open source software but it has been included in this report for two reasons:

-       StarOffice has been developed from the OpenOffice project, with commercial elements added, and sold as a commercial product. It has very similar functionality to OpenOffice and the case studies described in this report demonstrate that the functionality is adequate to replace conventional proprietary software;
-       The development of StarOffice is carried out using open source methods, and this facilitated the rapid introduction of new features in one of the case studies reported here.

No other OSS desktop suites were represented in the trials. Most sites quoted cost savings on software licences as the primary reason for wishing to migrate.

The experience of the sites was that the functionality of OpenOffice and StarOffice is adequate for the majority of users – typically those performing procedural and routine activities and accessing only "transaction" systems. There are some differences between StarOffice applications and the corresponding functions in Microsoft Office, but these do not affect most standard uses of the software. Most sites expected to continue to run a "mixed economy" of StarOffice and Microsoft Office; continued use of Microsoft Office by some users was supported, to accommodate those who required:

-       access to complex facilities not available in StarOffice;
-       compatibility with Microsoft Office for interoperability with external sites;
-       compatibility with back-office applications.

Interoperability was not seen as a major issue for most business purposes. Word processing documents, for example, can be exchanged using the ability of StarOffice to read and produce documents in Microsoft Word format. StarOffice also enables users to produce documents in Adobe Acrobat format, which facilitates document exchange. In the LinEx network in Extremadura, Open Source software only is used on all desktops. However, compatibility with Microsoft Access proved problematic for OGCbuying.solutions, and all the trials sites recognised the need to retain proprietary software on some desktops to handle the more complex documents, and to maintain interoperability with external sites – including some requirements for electronic document exchange with central government departments.

The experience of the case study sites suggests a number of guidelines for organisations considering migration to Open Source desktop solutions:

- careful planning is essential, including a review of the current use of desktop packages and facilities, and the types of documents which will need to be migrated;
- allow adequate time and effort for training of users, and reorienting them to the new desktop environment; training should be geared to the way in which the desktop packages will be integrated into the working practices of the organisation; be prepared to manage the expectations of users;
- plan for migration of users, desktops, files and documents, and desktop applications; allow for parallel working where necessary;
- pilot the migration exercise with a subset of users; identify those users who will migrate most easily, and start with them;
- define the baseline hardware platform and desktop configuration required, and plan for implementation across the organisation.

Several sites noted that migration to Open Source desktops provided an opportunity for revising work practices and operational standards, as well as procedures for administration, system management and security.

There was some experience of "thin client" implementation among the trial sites. Penwith DC is successfully running Sun thin client desktops with StarOffice, and Beaumont Hospital initially implemented a thin client architecture but were limited by their internal network capacity. Several sites expected to investigate thin clients more closely in the future, on the basis of the potential savings possible in desktop hardware platforms, and easier administration of system facilities.

4.3   Open Source: Business Applications
The case study sites included examples of:
- deployment of Open Source applications acquired as software packages under OSS licences;
- local development of applications to run on Open Source platforms;
- deployment of proprietary software packages configured by the supplier to operate on Open Source platforms – typically on a Linux platform.

In some cases, the portfolio of OSS applications in use is extensive – such as in the LinEx network in Extremadura, which provides a range of services based totally on Open Source software packages, both licensed and locally developed. However, the software packages available under Open Source licences are typically limited in scope; there were no examples of licensed OSS application packages being used for "mission-critical" business services.

Several sites encountered problems with the migration of existing applications to an Open Source platform. Issues which needed to be addressed included:
- applications which use embedded facilities of proprietary packages;
- applications which operate in a proprietary software environment but are incompatible with equivalent Open Source packages (such as an Open Source browser);

-       proprietary applications which are not available in a version suitable for deployment on an Open Source platform.

These instances suggest that public sector bodies should be aware of the potential problems in migrating applications to new platforms, and considering the future portability of applications as an important factor in application portfolio planning.

5   Open Source – Considerations

This section discusses a number of general issues in relation to Open Source software, not directly arising from the information gathered from the Proof of Concept trials.

5.1   Security

There is no definitive answer on the relative security merits of open- or closed-source software. The structure of the Linux/UNIX operating system is regarded by many as inherently more secure than that of proprietary operating systems, and Open Source software is less likely to be attacked by viruses than proprietary software. The Open Source code can be viewed in its entirety and in the event of a problem the worldwide Linux community can act to resolve any issue with urgency. However, while some argue that many eyes lead to fewer security flaws, others argue that those wishing to exploit, or tamper with, open source code have an easier time than with closed source code. This study has not investigated these claims in any detail either way. In practice, correct configuration and patching of any system is the first essential, whether based on open- or closed-source software. Recent developments such as the U.S. National Security Agency's security extensions to Linux (also being developed as TrustedBSD) are, however, generating significant interest as they make 'high-end' security mechanisms available to a much wider community than hitherto.

Governments around the world see advantages in these developments and are deploying Linux to meet highly secure needs. Military and Defence organisations in particular have been quick to seize on this particular advantage of Linux. In addition, OSS has until now been less prone to attack from hackers; it is also possible to "lock down" the kernel to provide a highly robust and secure platform. These features have led to the deployment of Linux in many secure projects (e.g. for the US Department of Homeland Security). A recent marketplace survey of 500 IT departments quoted Security as the second reason for Linux use over and above Total Cost of Ownership.

5.2   Role of System Integrators in adoption of OSS

Despite the significant momentum around Linux and OSS adoption, many service providers running outsourced services for public sector bodies seem uncertain about providing services to support the Open Source environment. This is surprising since most service providers have the necessary skills and are running significant elements of their own infrastructure on Linux today. If the service provider has Unix skills then in all likelihood they also have Linux skills. There can be a lack of communication between the commercial operators of the outsourcing contracts and the technical teams within the service providers. If Linux and OSS, including Open Source personal productivity software for desktops, make sense for a particular project then the public sector body should check that their current service provider has the confidence to deliver a service incorporating Open Source software where appropriate. The service

provider should be asked to outline their own use of Linux to support their IT infrastructures. When making a decision on the selection of a future service provider, the user organisation should satisfy itself that the proposed provider can deliver capability on OSS and the Linux platform; even if these are not a defined requirement today it would be wise to ensure the service provider contract has this capability as an option.

Many service providers are realising the significant commercial benefits to both themselves and their customers of deploying OSS and infrastructure based on Linux. The structure of some existing contracts might make the adoption of OSS desktops or Linux-based infrastructure unpalatable for some providers today. User organisations should be aware of whether their service provider might fall into this category. In one example a server consolidation of 180 Windows NT servers into 6 Intel/Linux servers was possible; user organisations should consider whether their server topology would enable a similar consolidation, and what effect this would have on their current outsourcing contract.

5.3   Legal issues
Organisations should be aware of a number of legal issues when considering Open Source products.

(a)   The Open Source Licence
Under Open Source licensing an organisation can, if it wishes, modify the software and release the modified version into the public domain. The licence may require that the source code of the modification is also made available, ~~putting the IPR into the public domain.~~.

This may not be necessary if modified software is used within an organisation only, but the licence should be checked to ensure that this is the case.

(b)   The SCO suit
SCO owns the rights to the main Unix operating system, Unix System 5 release 4, and claim that IBM, who licensed Unix from them, had copied a substantial amount of code into the Linux operating system and are in breach of SCO's copyright. SCO launched a lawsuit against IBM in 2003 which is still ongoing.

If proven, SCO's claim might enable them to claim royalties from some Linux users and they have entered into a number of suits against companies using both Linux and Unix. In the only case to be resolved, at time of writing, against DaimlerChrysler, the suit was substantially rejected.

Organisations considering using Linux should consider the risk from this case and act accordingly – some suppliers offer indemnification against legal action on systems supplied from them, this should be checked during the procurement process.

(c)   Patents
The European Union is considering changes to the EU directive on software patenting which could have an impact on existing Open Source Software. Again the risk should be taken into account when considering Open Source solutions. The implementation

of Open Source in the City of Munich was delayed for a short period while this was considered, but it was not judged a large enough risk to jeopardise the project.

5.4   Procurement issues

UK government policy is that Open Source products will be considered alongside proprietary ones, on a value for money basis. This requires that.

-        The product specification is based on function and does not include proprietary requirements, for example "a word processor capable of reading and writing Microsoft Word files" covers Word and a number of Open Source products.

-        The organisation's internal processes are not tied to proprietary standards, limiting the choice to proprietary software.

It is important to realise that the pricing model for Open Source is different to that for proprietary software. When an Open Source product is purchased the customer is usually paying for.

-        The media on which the software and manual are delivered

-        Support for the software.

5.5   Hardware resources and the "Green" agenda

One of the benefits frequently put forward for the use of Open Source Software is the level of resources needed to support it. This means that for equivalent Open Source and Microsoft Windows systems, the Open Source system will require less memory and a slower processor speed for the same functionality.

Open Source operating systems such as Linux do not usually have the regular major upgrades that are a feature of Windows, and thus do not have the requirement that goes with these upgrades for a new or upgraded computer to run them. This means that a computer running Linux can have a significantly longer working life than an equivalent computer running Windows. This has the potential to impact significantly on costs, including purchase of software and hardware, and indirectly by reducing business disruption whilst implementing change and upgrading. There are also potential Green Agenda benefits, through reducing the energy and resources consumed in manufacturing replacement equipment, and reducing landfill requirements and costs arising from disposal of redundant equipment.

Industry observers quote a typical hardware refresh period for Microsoft Windows systems as 3-4 years; a major UK manufacturing organisation quotes its hardware refresh period for Linux systems as 6-8 years.

6   Conclusions and recommendations

On the basis of the empirical evidence and experience reported from the trials sites and elsewhere, the current study has concluded that:

- *Viability of OSS:* Open Source software is a viable and credible alternative to proprietary software for infrastructure implementations, and for meeting the requirements of the majority of desktop users;
- *Obstacles to implementation:* The main obstacles to widespread implementation of Open Source software are: for desktop applications, the current lack of complex functionality which can affect ease of migration and interoperability for some organisations; and for business applications, the lack of Open Source products to compete with large-scale proprietary enterprise-level products; no significant obstacles were noted for the adoption of Open Source in infrastructure developments;
- *Costs and benefits:* Adoption of Open Source software can generate significant savings in hardware and software costs for infrastructure implementation, and reduce the licensing costs and hardware refresh requirements for desktop implementation;
- *Lessons learned:* Adoption of Open Source, particularly for the desktop, requires investment in planning, training of users, development of skills for implementation and support, and detailed consideration of migration and interoperability issues.

There are currently three main potential areas of implementation of OSS - on servers, the desktop and business applications, and these are currently at differing levels of maturity.

OSS Server and infrastructure products, generally based on Linux, are now perceived by the market as mature, gaining increasing acceptance, and delivering significant value for money opportunities. The experience of the trials sites confirmed this view. Inevitably cost comparisons cannot always be limited to the use of OSS alone, particularly in areas like server consolidation, which generate significant savings in their own right. However, there are still potential savings to be made that can reduce server costs significantly. Since these implementations are currently minimal in the public sector there is significant potential to generate savings both by undertaking server consolidation where appropriate and using OSS software.

OSS Desktop products (including desktop platforms such as Linux, and "office" personal productivity suites) are developing but there still has been little significant widespread implementation, though these are currently starting to be rolled out in public sector bodies in other European countries. Reports from the trials sites showed that generally OSS personal productivity software (such as OpenOffice or Sun's StarOffice) is adequate for transaction users, whose work is largely procedural and routine, and who constituted typically around 85-90% of the desktop users in the trial sites; but the software is not yet widely accepted for use by knowledge workers or "power users". The key issues here remain migration and interoperability of complex files and, though Open Source desktop applications have improved significantly, there can still be problems for the minority of files (such as some word processing documents and spreadsheets) which make use of complex features.

OSS Business Applications generally are still immature, and the scope of business applications available as Open Source software is limited. Those applications that do exist as Open Source are currently more appropriate for small or medium-sized businesses than for large public sector bodies, as they lack "industrial strength". The

database market has Linux and OSS offerings today to meet local departmental needs, with further significant developments expected in the next 2-4 years. In addition, many suppliers of proprietary software applications are making their products available on Open Source platforms. The experience of some of the trials sites has shown how previous choices of technology can lock in the organisation to proprietary products and make it more difficult to migrate to open source alternatives.

The short timescales of the current exercise, and in some cases the desire of trials sites to maintain confidentiality of financial details, have prevented OGC from coming to any firm quantified conclusions regarding the comparative total costs of ownership of OSS and proprietary software. In addition, it is always difficult to identify the benefits arising from migration to OSS in isolation from the impact of changes in other areas such as the system architecture and work practices. However, empirical evidence from user sites has shown how the adoption of Open Source software can reduce the costs of acquisition of both software and hardware. In considering the implications of migrating to OSS, organisations should undertake a comparison of costs and benefits, and take into account the full lifecycle costs of continuing to use, support and upgrade proprietary software.

In the light of the outcomes of the Proof of Concept trials, OGC recommends that public sector bodies should:
-   examine carefully the technical and business case for implementation of Open Source software and the role which OSS could play in current and future projects, working with their outsourced IT providers where appropriate;
-   review the potential for server consolidation, comparing the benefits of OSS with proprietary solutions;
-   consider the potential costs and benefits of migration to an OSS desktop for transaction users, (potentially in conjunction with use of "thin client" architecture solutions);
-   identify the role of open standards in future IS/IT strategy and policy, in conformance with the e-Government Interoperability Framework (eGIF);
-   consider requirements for the development of skills in Open Source development, deployment and operation within the organisation, and review the availability of such skills in their outsourced IT service providers;
-   review their current infrastructure and applications - in collaboration with their outsourced IT providers where relevant - well in advance of any planned procurement or renewal, and determine whether current technologies and IT policies inhibit future choice; and if so consider what steps may be necessary to prevent future "lock in";
-   consider the benefits of incremental change by diversifying OSS use beyond the server platform to products like Email, LDAP, Web and internet Browser.

Annexes

A   References, sources of information

UK government reports

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Malaysia
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USA
"Use of Free and Open-Source Software (FOSS) in the US Department of Defense"
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Other sources of information

The Center of Open Source and Government
http://www.egovos.org

IDA – Interchange of Data between Administrations
http://europa.eu.int/ISPO/ida/jsps/index.jsp?fuseAction=home

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The Open Source Initiative
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The table of equivalents/replacements/analogs of Windows software in Linux
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List of Open Source Software Packages
http://www.wordiq.com/definition/List_of_open-source_software_packages

SourceForge: Open Source Software Development Website
http://sourceforge.net/

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C   Details of Case Studies

Sites participating in the Proof of Concept trials
Central Scotland Police
e-Government Unit
Office of Water Services (OFWAT)
OGCbuying.solutions
Powys CC
A government department

Other UK sites contacted by OGC
MoD Defence Academy
Penwith DC
West Sussex CC
A government department
A large local authority

Case Studies from elsewhere in Europe
Beaumont Hospital, Dublin, Ireland
City of Munich, Germany
Extremadura, Spain

Central Scotland Police

Background
Central Scotland Police (CSP) have around 1000 users; IT facilities are managed in-house. CSP originally ran green screen terminals, but by 1997 had moved to personal computers and a small number of Windows/Microsoft Office desktops. In 2000 they made the decision to move to StarOffice 5.2 with a small number of Microsoft Office users where necessary.

CSP are about to commission a new, 85 seat Area Command office at Falkirk. The desktops in this office will be StarOffice running on Linux.

IBM Trial
CSP had a requirement for a document management system to support their requirements for Freedom of Information. IBM produced a prototype system to meet this requirement which was successfully demonstrated in April/May 2004. The document management system consists of a system built using IBM Domino driving a DB2 database, with no additional licensing costs. CSP and IBM are developing the system and a small number of key processes, plus training for their staff in process development. The system will run on two mirrored Linux-based servers, at Falkirk and Stirling, to give security.

The overall cost is about £60,000 but the system is flexible enough to develop into an Electronic Document and Record Management System (EDRMS) so the long term savings will be considerable – quotes for EDRMS have been as high as £700,000. Open Source savings are limited to the savings on two servers, which will be of the order of £20-30K over 5 years.

Open Source Desktop
A decision was made in 2000 to rationalise and adopt a standard office application as far as possible across the organisation. The cost of Microsoft Office - £200 per seat – led to a trial of StarOffice. The trial was successful and StarOffice was adopted for the majority of users. Approximately 15% of users retained Microsoft Office for reasons of compatibility with back office systems, or the need to exchange Microsoft Office documents with external authorities.

The cost of StarOffice is £8,000 per annum in support costs.

CSP is moving towards platform independent processes accessed via a browser and Email client. Since most processes involve a back-office system – for example when officers enter statements or reports – the majority of desktops do not need word processing or spreadsheet software.

Lessons
CSP has adopted StarOffice for the majority of users who require desktop systems with 15% retaining Microsoft Office. CSP is actively moving towards platform-independent back office systems.

The impetus for change has come from the adoption of a Best Value culture and the review of efficiency throughout the whole organisation.

e-Government Unit

Background
The Knowledge Network provides Digital interactive Television Services (DiTV) to both Central and Local Government. The system currently runs live in a Windows operating system environment.

Trials
The trial proposed as part of the OSS trials was that there would be merit in reproducing the DiTV environment with an identical software and hardware configuration but running in a Linux environment. The trial would seek to provide information in a number of areas.

1.   Issues identification for areas which would need to be addressed before Linux could be used within the live Knowledge Network infrastructure; in particular:
   * Optimisation of the software configuration to maximise the strengths of Linux as an operating platform
   * Appropriate security requirements for the hardening of the operating platform
   * Analysis of support issues which could impact delivery of live service.

2.   Production of metrics to assess the relative performance of the two environments in terms of:
   * Any changes to the performance of the application from a user perspective
   * Any changes to the number of users which could be supported in each environment both in terms of concurrency and maximums.

The build of the infrastructure with the Linux operating system was successful and proved to be stable. IBM provided suitable support to overcome some of the deficiencies in available documentation for the use of the Knowledge Network software portfolio on the Linux operating system.

Lessons learned
The build has proved that Linux is a viable server side operating environment for this service.

The trials, as expected, identified a number of areas which would require further investigation before a live system could be deployed. In particular, although the operating system was hardened to a certain degree as part of the trial it was apparent that further work would be required to produce an operating environment suitable to be accredited from a security perspective in order to allow live running. As this hardened environment was not in place it proved, within the timeframe of the trial, impossible to run meaningful load tests to establish whether there are performance improvements between the platforms.

The initial findings from the trial were very positive and have encouraged further work to move forward the potential for the use of Linux in the Knowledge Network's infrastructure build.

The identification of the appropriate hardened Linux environment is underway and will include the production of the metrics which it was not possible to complete as part of the trials.

Office of Water Services (Ofwat)

Background
Ofwat is the economic regulator of the water and sewerage industry in England and Wales. It has 250 staff in all.

The IT infrastructure is currently NT server and client, and Lotus Domino Email server and client software. The desktop is Microsoft NT and Office 97 with a few systems for converting files from new versions of Office and old Wordperfect documents. Various third party software applications are used for areas such as finance, personnel, etc.

The main in-house software application is the "Aquarius" financial model, a Microsoft SQL Server database back end with a VB/Excel front end system.

All IT is managed in-house. There are 4 technical staff, 1 helpdesk for support, and 4 development staff.

Ofwat is facing a costly upgrade to Windows XP as Microsoft support for Windows NT has ended.

IBM Trial
OFWAT wished to determine the feasibility of migrating the desktop to Linux/StarOffice and the servers to Linux. IBM installed a Lotus Domino server and client machine and carried out 2 feasibility studies on the Aquarius software to determine whether it was possible to access it via a Linux desktop. The options considered were:
- A costly rewrite of the Aquarius software to run on Linux;
- Running a mixed environment, with Microsoft desktops for users of Aquarius and Linux for other staff. Increased support costs would be offset by savings from using Linux desktops;
- Upgrade to Microsoft XP/Server 2003.

Ofwat is currently undertaking an option appraisal with input from IBM (Linux) and Civica (Microsoft).

Lessons
The main obstacle to change is the Aquarius software which uses Microsoft Excel and relies on Visual Basic macros to function. At the time this system was originated there was no viable alternative to Windows. The study concluded that rewriting the application would be expensive (but possible), and a mixed Windows/Linux environment may be the most cost effective short/medium term solution; users of the Aquarius application (and "power users" of Microsoft Office) would continue to use Windows, while most users would migrate to Linux/StarOffice.

Ofwat's experience with the Aquarius application suggests that any new software project should be planned using open standards to allow maximum choice of desktop in the future.

Office of Government Commerce Buying Solutions (OGCbs)

<u>Background</u>
OGC Buying Solutions is an Executive Agency of OGC providing procurement services to the public sector. Buying Solutions currently uses Microsoft Windows 2000 desktops and Microsoft Office software. Because of potential savings a pilot trial was launched to determine the viability of an Open Source desktop in the OGCbs environment.

<u>The Trial</u>
A fixed period trial was planned involving 12 users: 10 based in Norwich, one based in Liverpool and one remote worker. The trial started in February 2004 with some initial work, carried out by the Buying Solutions IT team, into developing a suitable Linux desktop. A pilot desktop was set up by IBM and demonstrated to the trial users towards the end of May. The general response was favourable – the desktop was regarded as easy to use and quite intuitive. The pilot desktop used SuSE Linux, StarOffice and the Mozilla browser.

The project was then delayed until mid June awaiting approval for connection to the Government Secure Intranet. A further problem became apparent in relation to an Access database used by the OGCbs staff. There is no Open Source database which will handle Access databases in their native format and none of the solutions proposed was completely satisfactory.

A new CRM system - Onyx - was installed by OGCbs. Onyx uses a browser interface but does not support the Open Source browser Mozilla, which is used in the pilot build.

Because of these issues a recommendation was passed to the OGCbs senior management that the project be halted and lessons documented. This was accepted and the trial was halted.

<u>Key points</u>
The use of vendor specific systems, and their inability to operate in an Open Source environment, was the primary reason for halting this trial.

Powys County Council

Background
Powys is a geographically large, thinly spread authority with resources scattered over a wide area. There are 2000 users in 4 main sites and a number of smaller local offices. The authority has a history of devolved budgets for IT which has resulted in individual departments purchasing servers. As a result Powys has 60 servers across 4 main sites, 40 of which are in the main Powys offices at Llandrindod Wells.

They have considerable experience of Linux as part of their infrastructure and have used it for over six years in schools and remote access points to manage file serving and email.

Moving to OSS
The original requirement was for a server management system which would allow remote management of their server resources, and reduce the travel needed to manage remote servers.

There are two IBM Linux-based projects running;
-        The Tivoli management software installation (procurement)
-        Samba file and print server (Proof of Concept trial)

IBM have installed 2 working Linux File and Print servers integrated with the Powys Sun1 Directory/Email/Calendar system.

The authority's needs may be fulfilled by as few as 4-8 servers. They will be taking advice from IBM about the number and specification of servers needed.

Powys plan to maintain the current 3 year refresh cycle and actively monitor the File and Print servers to identify the need to upgrade or replace before performance degrades. The trial servers are IBM boxes running Red Hat – support costs for Red Hat are £400 per server per annum.

VFM savings
Replacing 60 servers with 4-8 servers will lead to considerable saving in hardware, licensing and support, as well as savings in space and power usage. The saving is primarily due to rationalisation of equipment rather than adoption of OSS. There are likely to be savings in software licensing, support and increased efficiency. These savings will be difficult to quantify until the new File and Print servers are operational.

Future work
Powys have identified a large quantity of data currently in Excel spreadsheets which they intend to move to an SQL database and access through a browser interface. They are considering the suitability of MySQL in comparison with Microsoft SQL server (single server software cost approx £800).

Lessons
The main benefits to Powys are around rationalisation of servers.
The trial process has led to Powys identifying further areas where efficiency gains can be made.

A Government department

<u>Background</u>
The department has approximately 5,000 servers split as follows;
- 2,500 Unix servers running Legacy applications; a project is already under way to rationalise down to a much smaller number of modern servers.
- 2,500 Wintel servers running:
  - Application distribution management – Radia management suite
  - Infrastructure – File and Print
  - System software – DNS, Directory services (active directory)
  - Commercial Off The Shelf software (COTS).

For each 5 year refresh cycle these servers each cost £3k for hardware, £25k for licences and support costs - there are potential savings in licensing and support.

The department view the Microsoft monopoly position as unhealthy from a procurement viewpoint.
IBM trial
Linux File and Print servers have been integrated into the network, using Active Directory for authentication.

<u>Ongoing work</u>
Further tests will be carried out to determine what proportion of remaining functionality will transfer to Linux servers.

<u>Issues</u>
The Radia application management software is not available for Linux, and Linux based commercial alternatives are more costly.

Many COTS packages are not available for Linux.

<u>Other Issues raised</u>
As an indication of the cost of migration within a Microsoft framework, the cost of migration from Win95 to 2000 for the department was put at £10million.

The desktop is seen as an area for future work – especially around tailoring to the users' requirements; many users within the department only require Email and access to data entry systems, and do not need an Office suite.

The department's desktop management is outsourced and there were initial problems with getting information from the service provider.

<u>Lessons</u>
There are opportunities for savings using Linux servers.
Use of software which is Windows specific limits choices.
Cooperation is required from all involved parties.

MOD Defence Academy

Background
The Defence Academy comprises the Royal College of Defence Studies (RCDS) in London, the Joint Service Command and Staff College (JSCSC), the Royal Military College of Science (RMCS), and the Defence Leadership Centre (DLC) on the Shrivenham/Watchfield site, as well as the Conflict Studies Research Centre (CSRC) at Camberley and the Armed Forces Chaplaincy Centre (AFCC) at Amport House near Andover.

Currently desktops and servers are managed by Cranfield University; when this contract expires in 2006 it is likely to be replaced by an outsourcing agreement.

The desktops are Microsoft Windows/Office, Email server is Open Source and Authentication is managed using OpenLDAP

Open source projects.
The Academy intranet and internet services are managed internally and are run on Open Source products – Linux, Apache, Zope and Plone. The current system has been running for approx 2 years; previously the Academy used a Microsoft IIS server serving a static web site.

Because of the large amount of information to be managed, and the need to update from a number of sources, there was a need for a content management system. A number of systems were evaluated including Microsoft and Tridium. Zope/Plone was chosen primarily on functionality, not on cost.

The Internet/Intranet project required a considerable amount of development, and because of the nature of the Open Source community it was easy to identify high quality developers. Using a large proprietary supplier usually means having no control over the quality of developers. The down side is that currently there are a limited number of developers available.

The Academy's experience is that using open source is a double win – consultancy rates for developers tend to be 30% lower and development times are shorter.

All of the Open Source software used has been security accredited by the MOD.

The Academy's opinion is that Open Source software is more secure than the main proprietary equivalents for the following reasons.
-       Linux is a modular operating system consisting of relatively small components, which are more transparent in operation than a large integrated operating system.
-       Problems tend to be limited to one component of the operating system, and because each component is small in size it can be easily and quickly rectified.
-       The modular nature of Linux means that an installation can be limited to the components that are needed, reducing the number of ways the system can be attacked.

Main points
The open source intranet and extranet projects have been running successfully for two years.
The open source Zope/Plone solution was chosen on its functionality, not cost.
It is easier to identify good quality developers using open source.
The systems are inherently more secure.

Penwith District Council

Background
In 2002 Penwith had approximately 300 staff and ran a Sun enterprise server with 165 dumb terminals and 70-80 Windows PCs. To meet the recommendations of the IT Best Value Review and the requirements of e-Government, a standard desktop was required across the organisation that delivered increased functionality. It was also highlighted that IT should also be extended to include all members of staff and Councillors.

Move to OSS
Since any system chosen would require substantial retraining for both users and IT staff, training was identified as a key factor but not a limitation.

The decision was made on basis of best value. Options were:
-       Sun
        £450,000 overall cost.

-       Microsoft
        £480,000 for desktops only plus server cost plus back office software costs.

Penwith chose to use a Sun thin client system (SunRay) running StarOffice, with a small number of Windows machines for those requiring a mobile solution or specific external compatibility/software. Adding additional users to the system incurs a fixed cost of approx £400 for a thin client workstation.

Lessons
Penwith have been running their Sun-based thin client system successfully for 2.5 years.
Training was identified as key to a successful deployment.
Penwith were early adopters and worked in true partnership with Sun Microsystems to achieve a 'best value' solution.

West Sussex County Council

Background
West Sussex CC required an infrastructure to run their E-business systems on. Having chosen IBM Websphere as the portal software, they considered Sun, Windows and Linux infrastructures on which to run it.

West Sussex's existing server infrastructure is based on Sun and they had staff with Sun Solaris skills.

Open source implementation
There was a procurement in 2003 of E-Business infrastructure. The chosen system, Websphere running on Linux, was selected in preference to:
-        A Sun enterprise server system – West Sussex's existing infrastructure platform
-        Websphere running on Windows 2003.

The Linux system was around £480,000 cheaper than the Sun system and similar in price to the Windows system. Linux was chosen as a more reliable and stable platform than Windows. The cost savings are considerable but are mainly due to the cost of Sun hardware so this may not count as an Open Source saving.

Original cost estimates

Costs over 5 years	
Sun	£989,067
Windows	£467,242
Linux	£510,889

During implementation of the Linux system it was found that 4 fewer servers were needed because some functions could be shared across servers; this would not have been possible with the Windows system. The saving due to this reduction in numbers was £34,000.

Skills transfer from Sun Solaris to Linux was found to be straightforward. Two key staff members completed a 2 day training course and passed on their training to others.

Implementation was completed on schedule and under budget as fewer servers than originally specified were required.

Lessons
West Sussex chose Linux over Windows because of its reliability and stability.

A Government department

<u>Background</u>
The organisation is undertaking a major program to update and improve its IT systems. A primary objective is to ensure that open systems and standards are applied appropriately.

Whilst the desktop estate is Microsoft-based almost in its entirety it was evident that deployment of an open source, low cost alternative desktop could provide substantial savings.

Sun Microsystems Java Desktop System (JDS) has been identified as a possible alternative desktop solution. In January 2004, an agreement was reached with Sun to conduct a trial of the JDS to assess its suitability for use as a desktop within the organisation.

<u>Sun Trial</u>
A number of criteria were identified for assessment in the trial; these included functionality, look and feel, interoperability, performance, reliability, system management and security. The ability to access legacy devices, and the compatibility of the JDS with existing peripherals was also investigated.

For the trial three notebooks and 12 copies of the JDS were supplied by Sun.

The evaluation took place in one of the organisation's offices where the machines were connected to the local network infrastructure. During the evaluation an issues register was maintained between the organisation and Sun Microsystems. A satisfactory response/ resolution was received from Sun Microsystems on all issues raised.

<u>Issues</u>
- There were problems opening files from Windows shared drives, and in using the JDS file manager to copy files.
- Lack of integration with Microsoft Exchange server.
- Lack of system management tools – this was addressed by an upgrade, part-way through the trial.
- Security – local file encryption was not supported, though this will be available soon. The user password is held, unencrypted, in a configuration file for network printing – this issue has not been resolved.

<u>Possible ways forward</u>
Indications are that the JDS is not yet suited for introduction into a Microsoft-based architecture, but it would be suitable for a green-field site.
The organisation has procured a substantial number of JDS licences for deployment.

<u>Lessons</u>
There were difficulties introducing the JDS into a Microsoft architecture.
Performance, and look and feel of the software, were very good and would enable easy migration.
Sun were putting a lot of effort into addressing problems and supporting the users.

A large local authority

Background
The authority has 5000 desktop users, currently using a mixture of Win98 and WinXP. Desktop software is a mixture of Microsoft Office, WordPerfect and Lotus. Because of the cost of supporting the mixed environment, there was a need to rationalise the desktop software. The cost of a Microsoft Office solution led to an investigation of Open Source software.

Move to OSS
The authority's IT department carried out considerable research, contacting several councils and other organisations which are StarOffice users.

From a cost point of view the case for StarOffice was compelling – 5year licensing cost for 5000 users is approximately £186,000 against over £1.4 Million for Microsoft Office 2003 professional licenses.

From a functional viewpoint, StarOffice was regarded as having all the features required by 90% of users. In addition StarOffice has features lacking in Microsoft Office, including PDF export, XML primary file format, and more robust bullet and numbering facilities.

A pilot using StarOffice 6 was set up for 600 users in one of the authority's departments.

Issues discovered;
-       Incompatibility of documents – formatting and bullets/numbering schemes did not transfer properly.
-       Lack of Macro recording facility in the spreadsheet – this was resolved in StarOffice Version 7
-       The trial highlighted a lack of standardisation in working practices – addressing this has resulted in further efficiency gains.
-       Initial training provision needed improving.

Sun introduced a beta test new version of StarOffice, which resolved most of the issues raised in the pilot. The beta was later released as StarOffice 7.

A small number of users were identified who could not be easily migrated to StarOffice – power users, Excel macro users and users of other software packages.

Future planning
The pilot was successful enough to plan the roll out of StarOffice across the authority with the exception of the authority's Education and Lifelong Learning department (ELL). The roll out will start in November 2004.

ELL stayed with MS Office for the following reasons:
-       Educational cost of Microsoft Office is very low – approx £50 per desktop.
-       Most schools use Microsoft Office, so file compatibility is seen as an issue.

The planned split in the authority is 85% Star Office, 15% Microsoft Office 2003 but the number of Microsoft users is likely to be much lower than 15% and many of these are users

who have to complete financial returns for Central Government, which are automated using VBA.

The cost of licences for StarOffice over 5 years is £186,000 and the licensing cost for 15% of users to move to Microsoft Office 2003 is over £240,000, this price is without software assurance.

<u>Lessons</u>
StarOffice has all the features required for 90% of users and has additional features, such as PDF output, which are not available from Microsoft Office.
Most of the users who require Microsoft Office need it for communications with Central Government, which can only be performed using proprietary software.
The savings over a complete Microsoft Office installation are over £1 Million.
The pilot caused an examination of working processes and an improvement in efficiency from rationalising processes.
Training is key to successful deployment.

Beaumont Hospital, Dublin, Ireland

Background
Beaumont Hospital employs 3000 staff directly. The hospital has always followed a mixed-market policy for IT: it has 22 Linux-based servers and 14 Windows-based servers. The primary clinical application is based on an HP3000 mainframe, and finance applications run on a HP Unix system. In 2002 there were 1000 desktop machines running a variety of desktop personal productivity packages from several different suppliers.

Move to OSS
Beaumont Hospital was under severe financial pressure, and the cost savings achievable through migration to Open Source software were considerable. Hospital staff investigated Open Source options over a period of six months, and downloaded some OSS applications for experimentation purposes. The decision was taken to migrate to OSS, starting with a subset of the user desktops.

Implementation of OSS
The hospital deployed a variety of OSS applications, ranging from invisible infrastructure systems (Red Hat Linux) to more visible desktop applications such as StarOffice and SuSE Mail.

Implementation of StarOffice started with version 5.2 in February 2002, but this proved problematic and version 6.0 was deployed in September 2002. Initial implementation was based on thin client architecture but limitations on the internal network caused this to be abandoned in favour of desktop installation of the office suite. Some users chose not to install StarOffice and they continue to use their existing desktop suites. Star Office functionality has proved to be fully adequate for most users, although the presentation application lacks some of the advanced functionality of Powerpoint. External document interchange is effected through production and receipt of the corresponding Microsoft Office file formats. Email facilities are based on SuSE Mail, which provides all the functionality required by users.

Beaumont has implemented a Content Management System based on the Open Source Zope package. It supports the provision of information such as HR policies, laboratory standard operating procedures, personnel and nursing on-line forms, minutes of meetings, patient care documents, etc. The application is supplemented by close integration with Beaumont's LDAP directory server.

Beaumont has committed to the development of JAVA/J2EE as its principal reference architecture for software construction. The hospital selected the Open Source JBOSS product as an application server, and although they bought in consultancy to support the set-up the savings compared with purchase of the leading proprietary products amounted to £200,000+.

In order to support the development of staff skills and knowledge, the hospital wished to implement an e-learning system. It selected the Open Source Claroline package, which is a fully-functioning and fully-featured self-paced learning tool.

The IT staff developed a system to enable digital X-ray images to be retrieved and viewed on-line. The system was based on a Sun Fire V880 granted by Sun, and was developed in Perl scripts.

Experience of OSS
Key staff in the hospital – and particularly in the computer operations department – rapidly adapted to the new OSS environment; it helped that the hospital already had a strong experience of Unix applications. However, finding adequate expertise in OSS has been a continuing issue; external support is bought in as needed.

The functionality of the Open Source software in use is generally regarded as adequate to meet most user requirements. There was some user resistance to the migration to OSS desktops, and some users will continue to use proprietary software in a "mixed economy". User training was provided to support the migration to OSS, modularised and tailored to the requirements of each user.

There have been fewer security alerts since the move to OSS, but the overall level of system support and administration for the installation has not changed significantly. The Hospital is now completing the roll-out of OSS desktops to a total of 850 users by the end of 2004; current work is completing the integration of back-end facilities for system control and administration.

Costs
The estimated costs of OSS solutions compared with comparable commercial proprietary solutions are shown in the table.

Application	Open Source Software Solution		Comparable Closed Source Software Solution	
	Initial cost (€)	Total cost over 5 years (€)	Initial cost* (€)	Total cost over 5 years (€)
Desktop applications	27.5K (Star Office)	34.7K	120K (e.g. Microsoft Office)	288.5K
Content management	20K (Zope)	32.1K	126K (e.g. Lotus Notes)	140.2K
Digital Imaging – X-ray	150K	237K	4.3M	7.339M
Application server	10K (JBOSS)	60.5K	320K (e.g. Websphere)	595.3K
Email	1K (SuSE Email)	8.7K	110K (e.g. Lotus Domino)	175K
E-Learning	1K (Claroline)	4K	35K	175K
TOTAL	209.5K	377K	4.883M	8.713M

*including academic discount

Source
The information in this Case Study is primarily drawn from the paper:
"Open Source Software can Improve the Health of the Bank Balance – the Beaumont Hospital Experience" by B Fitzgerald and T Kenny (2003); available from:
http://67.69.12.117:8080/oscarResource/OpenSourceNews
Material used with the permission of the authors.
The assistance of T Kenny in the preparation of this Case Study is acknowledged.

City Of Munich, Germany

Background
The administration of the City of Munich operates around 14,000 desktops for 16,000 users. Around 300 software products are in use, supporting 170 different applications. Applications are mainly based on client/server architecture, with data held on servers which are Unix-based. Client desktops are based on Microsoft Windows NT 4.0 and Microsoft Office 97/2000.

Responsibility for planning and operation of IT is decentralised to departments; there is no central Help Desk, software distribution function or security management.

Move to OSS
When Microsoft announced the termination of distribution and support for the Windows NT 4.0 platform, the City of Munich was faced with a decision on how to migrate its IT facilities. The City commissioned a study of the migration options, covering:
- Migration of the client systems to Windows XP as the standard OS, including the associated Office XP products from Microsoft;
- Migration of the client system to Windows XP as the standard OS, using an OSS office suite (e.g. OpenOffice) for office applications;
- Migration of the client system to Linux as the standard OS, using an OSS office suite (e.g. OpenOffice) for office applications.

The outcome of the study was a decision by the City Council in May 2003 to migrate to Open Source for desktop platforms and office suite. The justification for this decision was based on the City's desire to achieve:
- more independence from producers
- more competition within the software market
- greater conformance with the strategic aims of the City, e.g. for IT system management and administration.

The City initiated the LiMux project (Linux in Munich) to take forward the planning and implementation of the new IT architecture. Planning activity (the "Conception" phase) started in June 2003, and the Migration phase was started in June 2004.

Planning phase
The aims of the LiMux project in the detailed Conception phase were:
- definition and realisation of a standard base client
- checking the technical possibilities, together with IBM and Novell/SuSE
- developing migration scenarios and the related costs and timelines as the basis for migration in the departments.

A number of sub-projects were established to take forward this phase of the work:
- the "Client Configuration" sub-project defined the requirements for the base client system configuration, and identified special workplace requirements and exceptions, where migration to OSS was not practicable;
- the "Open Test and Validation Centre" sub-project was responsible for verifying the possibility of workplace migration to Linux; it built a test centre and developed procedures for application migration and software distribution;

- the "Training and Launch" sub-project analysed the training requirements for migration, developed training modules and produced a training schedule for departments;
- the "Migration" sub-project defined the concepts for migration of departments, it defined migration scenarios, specified file formats for migration and interoperability, and produced a cost model;
- the "Infrastructure and Services" sub-project analysed the requirements and structure of the central services and the associated costs.

The "base" client workstation is based on Linux, and uses Open Office as the office suite and the Mozilla browser. Servers will be migrated to a Linux platform. The City policy is that all applications will be based on a web interface.

Migration

The aims of the Migration phase are:
- to migrate most of the city administration's work places to the Linux base client without compromising business; operating system and office suite independent solutions will be preferred;
- to migrate applications to web-based or native Linux solutions
- to consolidate and migrate standard applications
- to consolidate and migrate Microsoft Office macros, forms and templates
- to implement system management for the Linux client base.

The Migration strategy is for "soft migration": progressive migration based on the life cycle of products, and parallel operation. The "unproblematic" departments will be migrated first. Each department will be responsible for its migration strategy and implementation within the LiMux migration concept. It is expected that migration of departments will start in early 2005.

Lessons learned

Lessons learned from the Planning phase include:
- Open Source does not equate to "cost-free";
- The exercise showed up deficiencies in the city's central IT management and administration which would have had to be addressed in any event;
- Mirroring the existing IT facilities with OSS is achievable only with effort in tailoring OSS software;
- Integrating a variety of applications on an OSS platform raises difficulties which need to be addressed; user expectations have to be managed;
- Migrating to OSS provides an opportunity to establish new structures and processes, and to rationalise the application base.

Source
This Case Study draws mainly on the document "Introducing the LiMux Project", available from:
www.muenchen.de/linux

Open Source deployment in Extremadura, Spain

Background
Extremadura is the poorest region of Spain. It is located in SW Spain next to the border with Portugal, and has a population of around 1M scattered among 383 municipalities.

In the mid-1990s the regional government saw that IT could help the region overcome its historical "peripheral" situation, and in 1997 the Regional Strategy on Information Society was launched, with two main objectives:
-       accessibility for all: use of the Internet as a public service; and
-       stimulation of technological literacy.

Role of OSS
This strategy led directly to the creation of the LinEx (Linux in Extremadura) project. The objective of the project is to create a fully functional IT infrastructure based on FLOSS (Free/Libre and Open Source Software), providing universal access to IT tools for all citizens.

The LinEx project contributes to two goals:
-       an educational goal, through the implementation of an Educational Technological Network which provides one computer for each two students in all the schools in the region;
-       an economic and social goal, through the Technological Literacy Plan which spreads the adoption of free software in education, the local administration, local businesses and SMEs, and to all citizens through access to the Linex facilities.
The availability of fully functional software, that can be copied legally, helps to overcome economic barriers such as the high cost of proprietary software. The project calculates that at least €20M has been saved in the Education budget through the use of FLOSS instead of proprietary software.

The Regional Intranet provides 2Mbps communications access to more than 1800 access points including schools, other educational establishments, health centres, hospitals, local and regional administration offices, and local businesses. An educational portal has been created which allows teachers to share developments and spread the knowledge they have created.

34 "New Knowledge Centres" have been created in centres throughout the Region, mainly in rural areas, to provide universal access for citizens to the Internet. These Centres provide training facilities to all sectors of the population.

Implementation
Linex (otherwise known as GNU/LinEx) is based on GNU/Debian – a Linux distribution that makes it easy to create other distributions that can inherit its advantages. By using a modified Debian distribution, the Extremadura government has benefited from the large amount of software which it supports – over 8000 items. The main software applications incorporated in LinEx are:
-       the OpenOffice office suite
-       the GNOME graphic environment
-       web browsers: Galeon and Mozilla
and a full range of supporting applications (see reference).

The project funds a development centre which has created accounting software, hospital applications and agricultural applications. This software will be available free to all citizens.

More than 225,000 copies of the GNU/LinEx system have been distributed in CD format, and more than 100,000 copies have been downloaded from the Internet.

<u>Source</u>
This Case Study draws mainly on material available from:
http://www.linex.org/linex2/linex/ingles/index_ing.html